ITISS Validation Study on Winnipeg Inpatient Wards
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Abstract

The Intermediate Therapeutic Intervention Scoring System (ITISS) is a 24-hour scoring system used to assess a patient's medical intervention care requirements. The actual relationship between the ITISS score and total patient workload has never been evaluated in a medicine ward setting. This study observed patient care (direct bedside care and administrative/organizational care) for 360 patient days on medical wards and compared it to the ITISS score. The correlation was moderate with an r-value of .52. The point value-to-time relationship was varied depending on the acuity of the ward. Wards where active medical treatment occurred have a ratio of 1 point to 25 minutes. Wards were patients' conditions were stable and preparations were being made to transition them to alternative care locations had a ratio of 1 point to 34 minutes. This higher ratio indicates that while there may be fewer therapeutic interventions needed for less acute patients, there still is a high workload associated with caring for them that falls on the nursing staff.

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Introduction

In 2004 the Intermediate Therapeutic Intervention Scoring System (ITISS) was chosen as the best existing tool to document daily per patient medical interventions by a steering committee of the Medicine and Critical Care Database for managing and studying the internal medicine patient population in Winnipeg hospitals. Before this tool was implemented, a focus group of nurses and nurse managers reviewed the task list and made modifications to reflect local terms, to reduce interpretation errors, and to remove tasks that were not relevant to Winnipeg ward nurse activity.

Management and researchers hoped to use data from the ITISS to better understand the medical workload associated with different patient populations on each ward, and the impact of different management strategies and models on patient care.

As with many nursing workload tools, there were questions about whether the ITISS sufficiently captured enough components of nursing work to be representative of nursing time spent per patient. Nursing is based on a strong foundation of the biological, psychological and social sciences, the humanities, and research & ethics.[1] Nursing workload is not captured by measuring interventions alone. Providing a patient or their family with psychosocial support, communicating and comforting along with collaboration with other health care disciplines, paperwork and locating equipment are some examples of nursing care that is not measured using the ITISS.[2]

The aim of this study was to determine the relationship between therapeutic interventions and overall nursing care per patient.

ITISS Background

The ITISS currently used by some medicine bedside nurses in the Winnipeg regional hospital wards is based on the internationally recognized Therapeutic Intervention Scoring System (TISS). The specific intermediate version of this tool, which is comparable to the TISS tool used in ICU's, has never been validated as a workload measurement tool for the medicine ward patient population, nor has the adapted version of the ITISS used in Winnipeg Medical Ward.

In comparison to other quantitative tools, TISS is simple to use and an accurate tool. The objectives of TISS are to:

- to access ICU severity of illness,
- to measure utilization of ICU facilities,
- to determine required ICU nurse/patient ratios and
- to identify the number of appropriated intensive care beds.[3]

Cullen et al, realized a similar need for non-ICU patients acknowledging that the existing TISS tool focused too heavily on ICU interventions and monitoring processes to be an effective tool for non-ICU patients. In 1994 David Cullen et al, modified the TISS to create a tool that would be better suited to assess 24-hour workload associated with

monitoring and therapeutic modalities for patients staying in a non-ICU. The result was the ITISS, which included 26 new items. In addition, some of the weights associated to certain tasks were also changed and 18 items were deleted from the original items. The ITISS more appropriately represents nursing efforts outside the ICU. Changes, deletions and additions of items included in the new list were made, keeping in mind the original TISS assumptions that all interventions should be available within the hospital for medically justifiable reasons.

A study of 435 patients assessed using the ITISS tool compared to the TISS scores seemed to indicate that the two measurement tools correlate well (r=0.91).   They found that patients who scored high on the TISS also would score high on the additional 26 items added to the ITISS. Only diabetic patients and those that required EKG varied from this pattern and scored high on the 26 new items, while post surgical patients scored low on the new 26, but higher on the original TISS. ITISS better identified patient workload associated to a group of patients who typically would have scored low with the original TISS. These patients include those with cardiac or pulmonary problems and diabetes.[3]

Nursing Workload measurement tools

Many variations on the original TISS currently are in use. One of the most commonly used versions is called the TISS-28. Dr D.Reis Miranda, who has written extensively on nursing workload tool, revised the TISS-28 in 2003 expanding it to 30 items and renamed it the Nursing Activity Score (NAS). Miranda organized an extensive validation of this new version, testing it in 99 ICU's in 15 countries in 2003. The methodology he used for this study was by multimoment recording (MMR) of nurses' activities during a 24-hour period lasting a week. At 30 random moments during a day, nurses were asked to select the activity they were engaged in from a list, answering the question "what am I doing at this exact moment"[4] The list of items was created in consultation with 15 physicians and 10 nurses. This list was broken down into 4 categories: activities of care at patient level, activities not related directly to a patient (mainly ward management/maintenance and training related), personal activities, and other. The results of the study compared TISS28 and NAS scores collected concurrent to the MMR study. The results validated the new NAS as a workload measurement tool that also effectively represented Therapeutic interventions per patient in ICU's. Miranda's MMR validation technique is worth noting.

Levenstam and Engberg conducted an activity study in 1997 to determine the total minutes of nursing care per ward patient stay.[5] This was achieved through the use of three different study tools. A workload study used nurse researchers to document the activities of nurses every 15 minutes for 28 8-hour shifts covering days, evenings and nights, as well as weekends. Codes for nursing tasks were used and broken down into 4 categories; direct nursing care, indirect nursing care, unit related work and personal time. A second direct nursing care study was conducted documenting care received by individual patients every 10 minutes. The third tool was a survey given to the charge nurse asking about the quality of care given during a specific shift as well as the appropriateness of staffing levels.

Methodology

The multimoment study organized by Miranda required the volunteering of bedside nurses time to check tasks at 30 random intervals throughout the day with a large sample size involving 99 ICU's in 19 countries. Miranda's ICU nurse workload assessment methodology becomes less feasible on the ward where the nurse-to-patient workload is higher. With patient ratios of a minimum of 1:4 to 1:8, 30 random samplings per day would reveal very little about the care provided to an individual patient. The multimoment recordings could be increased to better represent a nurse's per patient workload, however, to even double the sampling number to 60, many intrude on the quality of patient care and result in questionable data.

The approach taken by Levenstam and Engberg has researchers monitoring staff and document on regular intervals, the tasks being performed by nurses. This technique eliminates added workload on the nursing staff, ensures consistent interpretation of task by trained researchers and removes any personal bias. However, the presence of the data recorders may also influence the behaviour of the observed (the Hawthorne effect). This technique also requires the employment of trained researchers. The Levenstam and Engberg model also uses two concurrent studies - one documenting direct nursing care at the patient's bedside and the other shadowing the nurse. The challenge with this model is there is no way to link bedside intervention for a specific patient and the indirect administrative and organizational care for that specific patient. To validate the ITISS, all work associated to a patient has to be captured per patient.

The proposed alternative methodology for the WRHA was a hybrid model - monitoring an individual nurse with their associated patient load, and following the same patients and the 2 or 3 nurses who care for them throughout a 24-hour day. An observer would document tasks performed for a specific patient by that nurse throughout the day in set 10-minute increments. Additional information such as if an orderly or another nurse assisted in the task could also be indicated.

The actual task-list, based on Levenstam and Engberg research and validated by a nursing focus group, covers all possible tasks performed by nurses in a 24-hour day but is not so specific as to make the data collector's job overly confusing. Each task was clearly defined to ensure there was no confusion on the part of the researcher as to what behaviour a certain task falls under. The following table contains the codes.

Code	Description	Code	Description
Direct Nursing Care		**Indirect Care**	
D-Com	Communicate with the patient and family	I-Notes	Nursing notes
D-Med	Medication, injections and infusions	I-Com	Communication about a specific patient
D-Nutri	Enteral nutrition	I-Med	Preparing medication, injections, infusions
D-Elim	Elimination	I-Trans	Transcribe medical orders
D-Hyg	Hygiene	I-Prep	Preparation for new patients
D-Trans	Transportation of patient	I-Disch	Discharge planning
D-Mob	Mobilizating, positioning, exercising	**Unit-related work**	
D-MD	Rounds or assist MD	U-Clean	Houskeeping, cleaning
D-Check	Routine checks and Surveillance	U-Admin	Administration
D-Test	Specimen gathering and testing	U-Err	Errands off unit
D-Proc	Treatment and procedure	U-Ed	Meetings, in-service education
Personal Time		U-Sup	Supplies, check, restock
P-Time	Personal time meal breaks	U-Phone	Answer unit phone & family inquires
P-Stand	Stand-by time		

With this approach, by the end of a 24-hour day there would be approximately 144 observations representing all work performed for a patient. If 10 patients are monitored per unit this means 1440 observations per day (A sample of the observation form can be found in Appendix A). The objective was to monitor 50 patient-days on each of three different wards at a primary hospital. This represents approximately 5% of the annual number of patients admitted to these wards. To reinforce the finding's generalizability and breadth of application, studies were conducted on three wards, two days each, at a tertiary hospital and a community hospital.
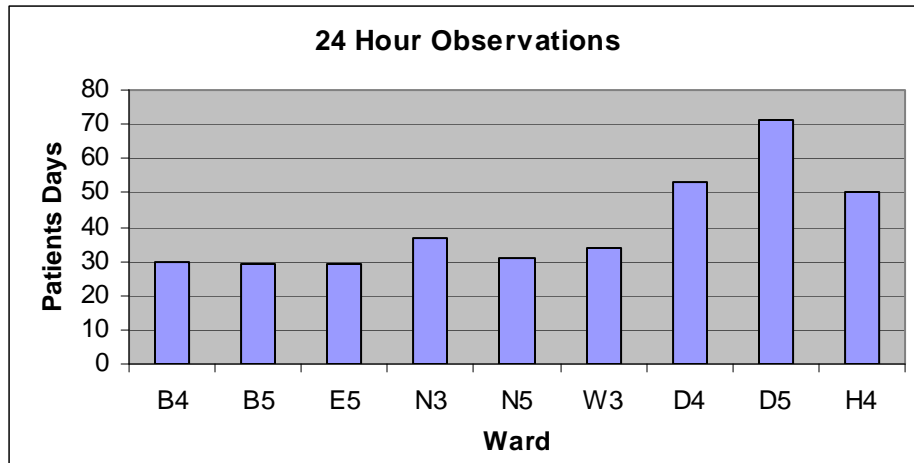
All observations were made by one of the seven trained researchers. Each researcher was given a one-day training season. They worked in pairs for 8-hour shifts watching 10-12 patients and a maximum of two nurses each. At the end of the study the researchers were asked to reflect on the study methodology and to provide constructive feed back (See Appendix B researchers' reflections on methodology).

The data produced by this 'time study' was filtered to eliminate any incomplete data and the number of nursing interventions was tallied per patient day. This was then compared to the ITISS scores obtained on the same patient for the same day. During the time of the study the ITISS scores was carefully verified through chart audits to confirm that they accurately reflected the treatment each patient received.
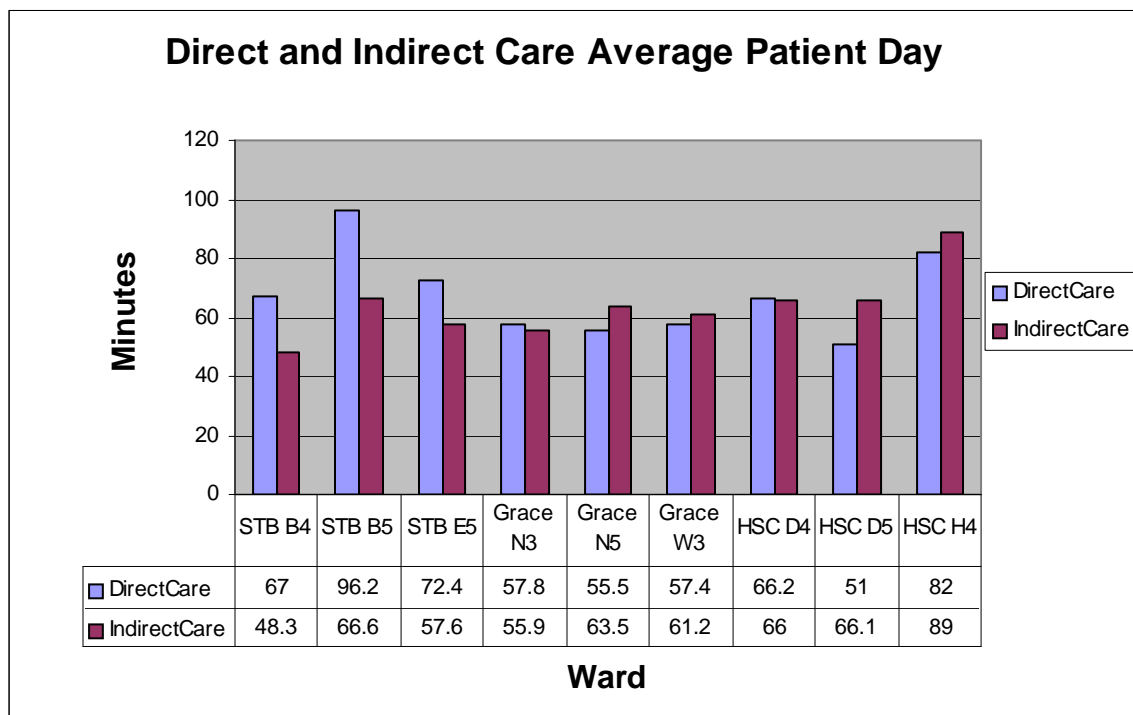
A subjective independent secondary study was also conducted by using the experience of the charge nurse to document what they perceived to be the actual workload or staffing requirements for a 24-hour shift compared to the ITISS results. The intention was to reflect uncommon conditions that could have influenced the normality of the data collected that day. As with the Levenstam and Engberg study, the charge nurse was asked to document any significant patient care irregularities during the shift (such as nurses leaving the ward to assist in another ward or to follow a patient for an abnormally long period of time) and to comment on staffing levels (low, medium or high). This survey also includes data on the actual staffing level compared to the baseline or normal staffing level for that shift (See Appendix C for this form).

Summary of data collected

In total 360 patient days were observed and had complete ITISS scores at three different hospitals on 9 different wards (There were four cases where the ITISS form was not completed so the observations were removed from the results). Wards H4, D4 and D5 were the primary location for the study; in total 5 days of observation occurred on each of these units while only two days of observations occurred on the other wards. There were several cases where an observer was forced to drop patients because during shift change the patient allocation of the night nurse was divided between 2 and 3 nurses making it impossible follow the activities of three nurses. The observations for these patient's were removed from the data set.   The following graph shows the number of patients per ward.

24 Hour Observations

A bar chart titled "24 Hour Observations" with y-axis labeled "Patients Days" (0 to 80) and x-axis labeled "Ward" with categories B4, B5, E5, N3, N5, W3, D4, D5, H4. Approximate values: B4 ≈ 30, B5 ≈ 29, E5 ≈ 29, N3 ≈ 37, N5 ≈ 31, W3 ≈ 34, D4 ≈ 53, D5 ≈ 71, H4 ≈ 50.

Based on the observations, it was possible to determine the average direct and indirect time spent per patient on each ward. Direct care included cases where on the 10 minute marker a nurse was attending to a patient, and indirect care meaning cases when on the 10 minute marker the observed nurse was doing work related to a specific patient but not at the bedside. The observations for each patient were summarized over the observation day. Each observation translated into 10 minutes of nursing care. It must be noted that researchers had a harder time documenting the indirect care. In cases where the observer was unable to ascribe a code to an individual patient and ended up using the same code for more than one patient, the 10-minute block was divided amongst the patients.

Direct and Indirect Care Average Patient Day

A grouped bar chart titled "Direct and Indirect Care Average Patient Day" with y-axis labeled "Minutes" (0 to 120) and x-axis labeled "Ward." The legend indicates DirectCare and IndirectCare.

|	STB B4	STB B5	STB E5	Grace N3	Grace N5	Grace W3	HSC D4	HSC D5	HSC H4
DirectCare	67	96.2	72.4	57.8	55.5	57.4	66.2	51	82
IndirectCare	48.3	66.6	57.6	55.9	63.5	61.2	66	66.1	89

The next table shows the historic average ITISS score by ward compare to those collected during this study as determined by the research nurses who were asked to review the ITISS scores for accuracy. The ITISS scores for this study were consistently higher than the previously recorded average by 2.3 points per day. This means that the ITISS scores historically recorded only represent 75% of the actual score. This is due to the greater attention given to the ITISS forms by the nurses during the study period when all were audited.

ITISS Comparison by Ward
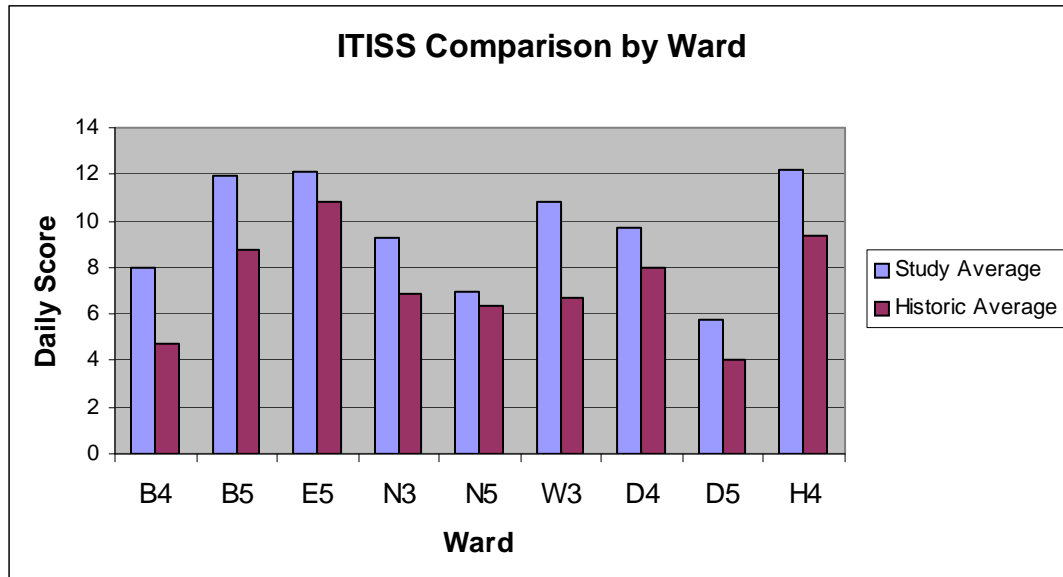
ITISS workload measurement correlation

The question that initiated this study was; what is the relationship between the ITISS score and actual nursing workload? The following scatter plot graphs out the observed minutes spent caring for each patient in relation to the ITISS score. The r-value of 0.49 indicates a moderate correlation.

Time per Patient Versus ITISS Score

$y = 9.9731x + 83.079$

$R^2 = 0.2448$
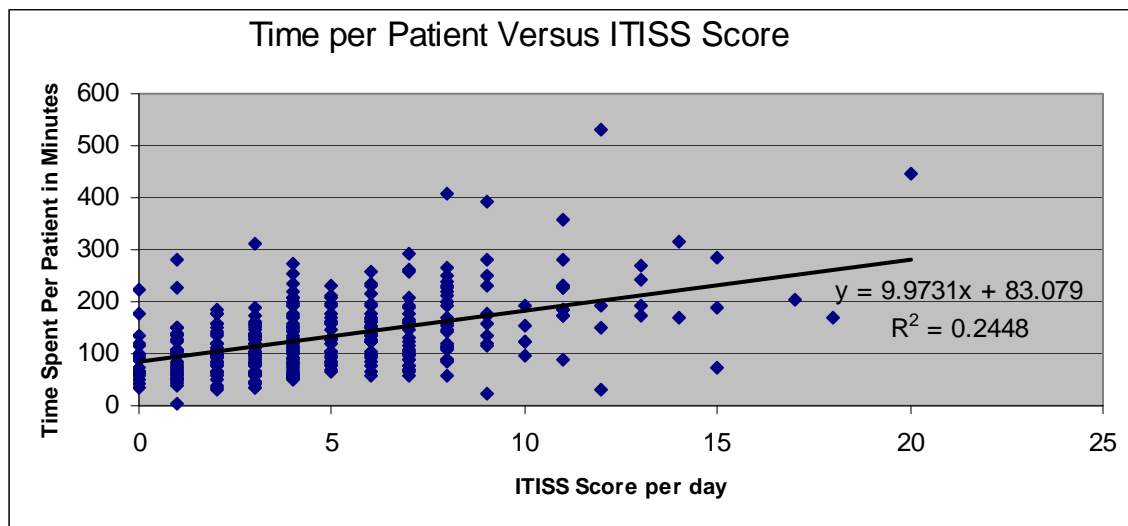
From these results it would appear that for every 1 ITISS point there were approximately 35 minutes of direct and indirect nursing work per patient. The clinical teaching units H4, D4, B5, E5, N3 and N5 had an average ITISS score of 5.6 at approximately 25 minutes of nursing time per ITISS point, averaging 139 minutes per day. The non-teaching units with less acute patients had an average ITISS score of 3.4 points at 34 minutes per point, averaging 115 minutes a day.

Since the ITISS score is intended to document therapeutic interactions, it is not surprising that the combined direct and indirect nursing care does not correspond exactly to the ITISS score. As was documented by the researchers, nurses perform many additional tasks - from assisting in emergency procedures to arranging for transportation. The nurses' workloads are influenced by their patients' ability to care for themselves and the availability of nursing assistance.

To determine if there could be a stronger correlation between the ITISS score and the observed time spent per patient, several adjustments were made to the ITISS element weights. This was approached in several different ways. Due to the number of ITISS elements (69) it was impossible to iterate over every possible weight permutation, so multiple regression analysis and manual step-wise incremental iterations were used. Both techniques concluded that adjusting the weights of the elements would only improvement the correlation to an r-value of 0.52. (See Appendix E for details)

During this analysis it was remarked on that although the ITISS is composed of 69 elements, in the 4652 ITISS forms in the database only 48 elements have ever been used within the WRHA. During this study only 44 elements were used, 26 of which were filled out more than 2 times. (See Appendix F for details) Finally the distribution of all daily ITISS scores, as seen in Appendix G, indicates that the scores are heavily concentrated with a kurtosis score of 2.72. This indicates that there is limited variation in the ITISS day collected.

Observations and Conclusions

This observation study indicates there is a moderate correlation between direct and indirect patient care and the ITISS score. The methodology for this study has limitations and was labour intensive, but ultimately was able to capture direct nursing care quite accurately. The observation of indirect care was more challenging and was influenced to a greater extent by the cooperation of the nurses observed and the assertiveness and attentiveness of the researchers.

Questions that remain to be answered are to what extent can a tool modeled initially for patients with higher acuity work on Winnipeg's medium and low acuity medical wards. This time study indicates that wards where medical intervention is limited; there is still a significant per patient nursing workload. This supports the argument that ITISS does not work as a stand-alone nursing workload measurement tool either because the tool itself does not include all nursing work or because nurses are also asked to do additional dues such as patient attend.

This study also brought to light questions about the appropriateness of the elements in the existing tool. Some work elements are common to all patients, questioning the necessity of documenting the work, while others elements never occur or occur extremely infrequently. Work associated to admissions and discharges, which prominently influenced the per-patient nursing workload, is not reflected at all on the ITISS tool because the tool is only focused on medical intervention. There are also work elements pertaining to post surgical care that could be extracted for other data sources.

Lastly the usefulness of the ITISS tool in its present state or in any future variation is fundamentally dependent on the accuracy with which it is filled out. Though several efforts have been made to clarify and remind staff to complete the form, this study demonstrates that only 75% of ITISS work is typically reported. This is partially due to the lack of relevance the form has to those that fill it out. It has no impact on patient care nor are they provided with any feedback that indicates it has any relevance to any other decision-making.

References

[1] (College of Registered Nurses of Manitoba *Entry Level Competencies for Registered Nurses in Manitoba, 04/05*).

[2] (Miranda, D.; Rijk, A.; Schaufeil, W., 1996. <u>Simplified therapeutic intervention scoring system: The TISS-28 items - Results from a multicenter study.</u> *Critical Care Medicine, 1996 Vol. 24; pg 64-73).*

[3] Cullen DJ, Nemeskal RA, Zaslavsky AM, Intermediate TISS: A new Therapeutic Intervention Scoring System for Non-ICU patients, Crit Care Med 1994

[4] 2 Miranda DR, Nap R, Rijk Angelique, Nursing Activity Score, Crit Car Med 2003 31:374-382

[5] 3 Levenstam KA, Engberg B, How to translate nursing car into costs and staffing requirements: part two in the Zebra system, Journal of Nursing Management 1997 5:105-114